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October 15, 2019

Steven T. James
House Clerk
State House Room 145
Boston, MA 02133

Michael D. Hurley
Senate Clerk
State House Room 335
Boston, MA 02133

Dear Mr. Clerk,

Pursuant to Section 67A and 67C of Chapter 111 of the General Laws, please find enclosed a report from the Department of Public Health entitled *Preterm Hospital Discharge and Quality Improvement*.

Sincerely,

Monica Bharel, MD, MPH
Commissioner
Department of Public Health

Charles D. Baker
Governor

Karyn Polito
Lieutenant Governor



Marylou Sudders
Secretary

Monica Bharel, MD, MPH
Commissioner

Preterm Hospital Discharge and Quality Improvement

2019 Annual Report

October 2019



Legislative Mandate

The following report is hereby issued pursuant to Subsection (b) of Section 67A of Chapter 111 of the Massachusetts General Laws (M.G.L.) as follows:

(b) The department shall submit an annual report to the general court not later than October 1 on the status of premature and high risk infants. The report shall include: (i) a description of the progress in implementing [section 67C](#); (ii) information about the incidence and cause of re-hospitalizations of infants born premature within their first 6 months of life; and (iii) recommendations for improvement of newborn health outcomes and ensuring continued health quality improvement, including recommendations concerning technological needs to improve monitoring of premature infants after discharge from the hospital and transition to a health care provider.

For reference, M.G.L. c. 111 section 67C reads in relevant part as follows:

(b) The department shall, in consultation with the department's multidisciplinary perinatal advisory committee, develop standardized procedures for hospital discharge and follow-up care for premature infants and shall ensure that standardized and coordinated processes are followed as premature infants leave the hospital from a well-baby nursery, step down or transitional nursery or neonatal intensive care unit and transition to follow-up care by a health care or homecare provider.

(c) The department and its advisory committee shall utilize national evidence-based guidance, including, but not limited to, from the Centers for Medicare and Medicaid Services' Neonatal Outcomes Improvement Project or the Institute for Healthcare Improvement's national initiative for children's healthcare quality to establish hospital discharge follow-up care processes.

(d) The department shall utilize existing perinatal databases, such as the pregnancy to early life longitudinal database to develop a statewide report on the causes and incidence of re-hospitalizations of infants that were born premature and who are within their first 6 months of life. The department's perinatal advisory committee shall use such report in developing their standardized procedures.

Executive Summary

Preterm birth, defined as the birth of an infant before 37 weeks gestation, is the most frequent cause of infant mortality and morbidity and is a leading cause of long-term neurological disabilities in children.¹ In 2005, it is estimated that preterm births cost the U.S. health care system more than \$26 billion.² Prolonged Neonatal Intensive Care Unit (NICU) stays, rehospitalization, and other post-discharge health care use constitutes a significant portion of preterm infant care costs. According to preliminary birth data for 2015 from the National Vital Statistics Report, 11.29% of the nearly 4 million births in the United States were preterm.³

The American Academy of Pediatrics (AAP) reports that “infants born preterm with low birth weight who require neonatal intensive care experience a much higher rate of hospital readmission and death during the first year after birth compared with healthy term infants. Careful preparation for discharge and good follow-up care after discharge may reduce these risks.”⁴

This report on Preterm Infant Hospital Discharge and Quality Improvement was developed in response to sections 67A and 67C of M.G.L. chapter 111 . The Department of Public Health (the Department) in consultation with the Department’s multidisciplinary Perinatal Advisory Committee (PAC), was tasked with responding to these legislative mandates.

Implementation of Section 67C

The Department convened the Perinatal Advisory Committee (PAC) in October 2016. One key item discussed and presented at the October 2016 meeting was to inquire about the continuation and need of four existing waivers within licensed perinatal services: Gestational Age; Continuous Positive Airway Pressure (CPAP); Short Term Mechanical Ventilation (STMV); and, Neonatal Intensive Care Unit (NICU) Transport. The PAC recommended continuing to monitor the waivers. Regarding the NICU Transport waiver, in 2017, the Department amended the hospital licensure regulation (105 CMR 130.000) to allow a physician assistant with neonatology training to participate in the transport to a Level III NICU.

¹International classification of diseases and related health problems.10th revision. Geneva: World Health Organization; 1992

²Centers for Disease Control and Prevention.2014 Preterm Birth.<http://www.cdc.gov/reproductivehealth/MaternalInfantHealth/PretermBirth.htm>

³Hamilton BE, Martin JA, Osterman MJK, et al. Births: Provisional data for 2016. Vital statistics rapid release; no 2. Hyattsville, MD: National Center for Health Statistics. June 2017. Available from: <https://www.cdc.gov/nchs/data/vsrr/report002.pdf>.

The Department is in the process of re-convening the Perinatal Advisory Committee to advise the Department on the continuation of the waivers. The Department anticipates holding a Perinatal Advisory Committee meeting in fall 2019.

Re-hospitalizations of infants born premature within their first 6 months of life

Incidence and causes of rehospitalization among premature infants born in Massachusetts in calendar year 2016

The results shown in this report are based on data analyses from the Pregnancy to Early Life Longitudinal (PELL) Data System. PELL is a unique, longitudinal, population-based reproductive health data system that enables Massachusetts to monitor the health and well-being of mothers and infants over time and to assess the effectiveness of state maternal and child health programs and policies. The core PELL dataset comprises Massachusetts birth certificates and fetal deaths records from 1998-2016, linked to the corresponding hospital discharge records of birth for the mother and infant. This core dataset is further linked longitudinally to non-birth related health services utilization data, using hospital discharge records, observational stays and emergency department visits for the mother and the child.

In order to address hospital discharges and quality improvement for preterm and high-risk infants, the Department has analyzed core PELL data linked longitudinally with non-birth hospital discharges for all infants born in 2016. As more recent birth cohorts are linked longitudinally with their corresponding non-birth hospital discharges, this report will be updated.

Methodology

The Department analyzed the frequency and causes of rehospitalizations among infants during the first six months of life using PELL data for the 2016 birth cohort.⁵ All analyses were restricted to live-born infants born in Massachusetts hospitals to Massachusetts resident mothers. Rehospitalization was defined as readmission to the same or a different hospital within the first six months (less than 180 days) of life after the infant was discharged home. Infants readmitted on the same day they were discharged were regarded as transfers; transfers were not counted as rehospitalizations.

Preterm infants were defined as infants born at less than 37 weeks gestation. For the purpose of this analysis, high-risk infants were defined as full-term (equal or greater than 37 weeks) but small for gestational age (SGA) in accordance with M.G.L. c. 111

⁵ 2016 is the most current data available.

section 67A (a), which reads, “Within 10 days after the birth of any infant weighing 2500 grams or less or any infant with a high-risk problem as defined by the department.” The SGA classification of birth weight percentiles by gestational age is a more accurate definition of high-risk among infants compared to the fixed birth weight of 2500 grams, which does not account for gestational age. In this analysis, normal birth weight and SGA categories were calculated using the 10th percentile.

Causes of rehospitalizations were based on the primary diagnosis recorded in each non-birth hospital discharge record using the International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM) codes.

Based on the annual report requirements as outlined in statute, the Department examined the incidence and causes of rehospitalization for the following three categories among infants born in 2016:

- (1) Full-term infants (equal or greater than 37 weeks) with normal birth weight based on their gestational age;
- (2) Preterm infants (less than 37 weeks) regardless of their birth weight; and
- (3) High-risk infants defined as full-term but SGA.

Results

In 2016, 70,255 live infants were born to Massachusetts resident mothers. These data do not include infants with unknown gestational age and/or birth weight (n=97). The 70,255 births were analyzed according to the three categories defined above: full-term with normal birth weight represented 82.3% (n= 57,785); preterm infants represented 8.8% (n= 6,204); and full term high-risk infants represented 8.9% (n= 6,266) (Table 1).

Of the 70,255 reported live births, 2,990 infants (4.3%) were rehospitalized at least once within the first six months of life. Rehospitalization varied by identified categories: 7.7% of preterm infants and 4.3% of high risk infants were rehospitalized while 3.9% of full-term normal birth weight infants required hospitalization (Table 2).

The causes of rehospitalization, as defined by the primary ICD-10-CM diagnosis in the non-birth hospital discharge records, were analyzed by occurrence instead of by infant; for example, if an infant was rehospitalized twice within six months of life, both causes of rehospitalization were counted in this analysis. As a result, the total numbers of rehospitalizations for preterm and high-risk infants exceed the numbers of infants who were rehospitalized in these categories. The top three causes of rehospitalization (n=544 occurrences) among preterm infants were: (1) Certain Conditions Originating in the Perinatal Period (31.8%); (2) Diseases of the Respiratory System (26.1%); and (3) Congenital Anomalies (6.6%) (Table 3-1).

Similarly, the most frequently reported primary ICD-10-CM diagnosis codes resulting in rehospitalization of high-risk infants (n = 334 occurrences) were (1) Diseases of the Respiratory System (29.6%); (2) Certain Conditions Originating in the Perinatal Period (25.7%); and (3) Congenital Anomalies (10.2%) (Table 3-2).

Detailed information about the causes of rehospitalization for preterm and high-risk infants within their first six months of life is presented in Tables 3-1 and 3-2.

Conclusion

In comparing 2015 data to 2016 data, preterm live births to Massachusetts resident mothers increased slightly from 8.5% to 8.8%. The percentage of high risk infants (full-term but SGA) decreased slightly from 9.0% to 8.9%. The proportion of infants who were hospitalized within the first six months of life was 4.3% compared to 4.4% in 2015. Overall causes for rehospitalization within the first six months of life were varied but the total number of rehospitalizations was consistent from 2015 to 2016. The percentage of rehospitalizations due to diseases of the respiratory system increased from 25.8% in 2015 to 26.1% in 2016 among preterm infants and from 22.9% in 2015 to 29.6% in 2016 among high risk infants mostly due to an increase in acute respiratory infections. The percentage of rehospitalizations due to certain conditions originating in the perinatal period increased from 28.5% in 2015 to 31.8% in 2016 among preterm infants and from 22.9% in 2015 to 25.6% in 2016 among high-risk infants. The percentage of congenital anomalies decreased from 7.1% in 2015 to 6.6% in 2016 among preterm infants and 15.0% in 2015 to 10.2% in 2016 among high-risk infants.

Recommendations

The Department continues to work with health care providers and members of the PAC to identify evidence-based recommendations that will result in improvement of newborn health outcomes and ensure continued quality improvement. To ensure that standardized and coordinated processes are followed as preterm infants leave the hospital and transition to follow-up care by a health care or homecare provider, Department health care facility surveyors monitor facility compliance with regulatory requirements through onsite surveys at hospitals, off-site communications, and complaint investigations, as necessary. Additionally, the Department and the PAC will continue to ensure guidelines and recommendations are appropriate for preterm infants during hospital discharge and follow-up care.

Conclusion

Massachusetts continues to work on reducing preterm birth rates in the state. The Department works with the March of Dimes to guide perinatal quality improvement across hospitals. Additionally, the Department is on the board of the Massachusetts Perinatal Neonatal Quality Improvement Network (PNQIN), a collaborative that brings together the Neonatal Quality Improvement Collaborative of Massachusetts (NeoQIC) and the Massachusetts Perinatal Quality Collaborative (MPQC), two statewide organizations that seek to engage health care providers, community organizations, and public health groups in neonatal and perinatal quality improvement initiatives. In 2019, the Department presented data to PNQIN on opioid exposed newborns and advocated for evidence-based screening for substance use in all pregnant women. In addition, the Department, through the Healthcare Associated Infections (HAI) program within in the Bureau of Health Care Safety and Quality continues to provide NeoQIC with data on Level III NICUs. NeoQIC is a voluntary organization, open to all hospitals in Massachusetts with Level III NICUs, that supports quality improvement in the health care of newborns through the open sharing of information and practices.

The Department has also been a leader in the Collaborative Improvement and Innovation Network (CoIIN) to Reduce Infant Mortality, which is funded by the Health Resources and Service Administration (HRSA). The CoIIN is a multiyear national movement engaging federal, state and local leaders, public and private agencies, professionals and communities to employ quality improvement, innovation and collaborative learning to reduce infant mortality and improve birth outcomes. Three strategic areas of focus selected by the Department-led Massachusetts CoIIN team are Social Determinants of Health, Prevention of Preterm and Early Term Births, and promotion of safe sleep practices. The CoIIN teams are working to incorporate evidence-based policies and programs and place-based strategies to improve social determinants of health and equity in birth outcomes. Through participation in the Infant

Mortality COLIN, the Department convened a workgroup to address the effect of pre- and early-term birth on infant mortality. The workgroup conducted surveys to identify patients who experienced preterm birth and to understand barriers to the administration of appropriate interventions eligible to women who have experienced pre-term birth.

Addendum

Table 1. Number and Percentage of Massachusetts (1) Term, Normal Weight, (2) Preterm and (3) High Risk (Term SGA) Live Births 2016

	N	%
Term, Normal Weight	57,785	82.3%
Preterm	6,204	8.8%
High Risk (Term, SGA)	6,266	8.9%
Total	70,255	100.0%

*Total does not include 97 reported births where gestational age and/or birth weight are unknown.

Table 2. Number and Percentage of Massachusetts (1) Term, Normal Weight, (2) Preterm and (3) High Risk (Term SGA) Live Births in 2016 Rehospitalized Within the First Six Months of Life

	Total	Rehospitalization	
		N	%
Term, Normal Weight	57,785	2242	3.9%
Preterm	6,204	476	7.7%
High Risk (Term, SGA)	6,266	272	4.3%
Total	70,255	2990	4.3%

*Total does not include 97 reported births where gestational age and/or birth weight are unknown.

**Table 3-1. Causes of Rehospitalization Within First Six Months of Life:
Preterm Infants, Born in 2016**

Causes		N	%
Diseases of the respiratory system (ICD-9-CM Codes 460-519, ICD-10-CM Codes J00-J99) (N=142, 26.1%)	Acute respiratory infections	117	21.5%
	Pneumonia and influenza	12	2.2%
	Pneumoconiosis and other lung diseases due to external agents	1	0.2%
	Other diseases of respiratory system	12	2.2%
Certain conditions originating in the perinatal period (ICD-9-CM Codes 760-779, ICD-10-CM Codes P00-P96) (N=173, 31.8%)	Neonatal jaundice	46	8.5%
	Infections specific to the perinatal period	12	2.2%
	Other respiratory conditions of fetus and newborn	16	2.9%
	Respiratory distress syndrome	9	1.7%
	Disorders relating to short gestation and low birthweight	46	8.5%
	Endocrine and metabolic disturbances specific to the fetus and newborn	4	0.7%
	Hemolytic disease of fetus or newborn, due to isoimmunization	6	1.1%
	Perinatal disorders of digestive system	3	0.6%
	Conditions involving the integument and temperature regulation of fetus and newborn	9	1.7%
	Slow fetal growth and fetal malnutrition	1	0.2%
	Other and ill-defined conditions originating in the perinatal period	21	3.9%
Congenital Anomalies (ICD-9-CM codes 740-759, ICD-10-CM codes Q00-Q99)		36	6.6%
Other Causes		193	35.5%
Total		544	100.0%

**Table 3-2. Causes of Rehospitalization Within First Six Months of Life:
High Risk Infants (Full-term, SGA), born in 2016**

Causes		N	%
Diseases of the respiratory system (ICD-9-CM Codes 460-519, ICD-10-CM Codes J00-J99) (N=99, 29.6%)	Acute respiratory infections	89	26.6%
	Pneumonia and influenza	5	1.5%
	Pneumoconiosis and other lung diseases due to external agents	2	0.6%
	Other Diseases of The Upper Respiratory Tract	3	0.9%
	Other diseases of respiratory system	5	1.6%
Certain conditions originating in the perinatal period (ICD-9-CM Codes 760-779, ICD-10-CM Codes P00-P96) (N=86, 25.7%)	Neonatal jaundice	28	8.4%
	Infections specific to the perinatal period	7	2.1%
	Other respiratory conditions of fetus and newborn	3	0.9%
	Disorders relating to short gestation and low birthweight	6	1.8%
	Endocrine and metabolic disturbances specific to the fetus and newborn	3	0.9%
	Hemorrhagic and hematological disorders of newborn	1	0.3%
	Perinatal disorders of digestive system	2	0.6%
	Respiratory distress syndrome	3	0.9%
	Conditions involving the integument and temperature regulation of fetus and newborn	16	4.8%
	Fetus or newborn affected by maternal conditions which may be unrelated to present pregnancy	1	0.3%
	Other and ill-defined conditions originating in the perinatal period	16	4.8%
Congenital Anomalies (ICD-9-CM codes 740-759, ICD-10-CM codes Q00-Q99)		34	10.2%
Other Causes		115	34.4%
Total		334	100.0%